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ABSTRACT

The report focuses on the diet management of infant and preschool children with phenylketonuria (PKU), a congenital deficiency resulting in brain damage. The effective methods for rapidly lowering serum phenylalanine levels following diagnosis are discussed, a method for prescribing and calculating the phenylalanine-restricted diet is described, and diet management problems and the role of "anticipatory guidance" in their prevention are outlined. Methods for teaching the phenylalanine restricted diet to parents are considered. Tables and forms with statistical data relating to the diet are included, as well as a list of professionals in the field. (SBH)

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DIET MANAGEMENT OF PKU

for INFANTS and PRESCHOOL CHILDREN

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Preface

The Collaborative Study of Children Treated for Phenylketonuria is a joint effort of 15 clinical programs coordinated through Children's Hospital of Los Angeles and supported by the Bureau of Community Health Services through funds appropriated under title V of the Social Security Act. This report was prepared by the Collaborative Study to provide information to nutritionists and dietitians on methods of diet management for children treated for phenylketonuria.

Based on results from the Collaborative Study, intellectual status of children whose serum phenylalanine levels were 5.5-9.9 mg/dl did not differ from those who had serum phenylalanine levels of 1-5.4 mg/dl (1). Because of this finding, physicians in the Collaborative Study are suggesting that serum phenylalanine in the range of 2-10 mg/dl is a safe treatment range. Recommendations for phenylalanine intake in this report are based on maintaining serum phenylalanine levels of 2-10 mg/dl.

Phyllis B. Acosta, Dr. P.H.

Introduction

The objective of diet management in the child with phenylketonuria (PKU) is to maintain serum phenylalanine levels that will allow the fullest development of intellectual potential while supplying adequate protein and energy for optimal growth and prevention of hunger. Essential amino acid, nitrogen, vitamin, mineral and fluid needs of the infant and preschooler must also be met. Because of these requirements, the special services of a metabolic disease treatment center with an adequately trained professional team should be utilized in treating children with PKU.

Control of serum phenylalanine levels during infancy is dependent on three factors: appropriateness of the diet prescription to the needs of the infant, understanding of the diet by the parents and the frequency of infections. Other factors are involved in maintenance of serum phenylalanine levels as the child progresses to the toddler and preschool ages, particularly since parents occasionally delegate management of the child to others. For example, the child may be given food by neighbors, relatives, friends, and siblings who do not understand PKU and its management by diet.

This report discusses effective methods for rapidly lowering serum phenylalanine levels following diagnosis, describes a method for prescribing and calculating the phenylalanine-restricted diet, and outlines diet management problems and the role of "anticipatory guidance" in their prevention. Methods and materials are given for teaching the phenylalanine restricted diet to parents.

Methods of Diet Inception

The objective of initial diet therapy in infants found to have phenylketonuria is to lower serum phenylalanine to below 10 mg/dl as rapidly as possible, within 1 week if feasible. In the Collaborative Study of Children Treated for Phenylketonuria it was found that the most rapid decline of serum phenylalanine level following diagnosis was obtained by feeding normal dilution Lofenalac®* with no added phenylalanine source (2). This method of initial treatment should not be used, however, unless the infant is hospitalized and daily blood specimens are being obtained to determine the serum phenylalanine levels. Laboratory results should be checked promptly to detect abnormally low serum phenylalanine levels which may indicate impending phenylalanine deficiency.

In the event that the infant or child is not to be hospitalized for diagnosis or only weekly serum phenylalanine levels are to be obtained, a maintenance Lofenalac formula containing adequate phenylalanine from an appropriate source should be prescribed (table 1).

The rapidity of decline in serum phenylalanine level is directly related to weight gain, dietary intake, urinary loss of phenylalanine and body protein turnover. A smaller daily weight gain or urinary loss would lead to a slower decline in serum phenylalanine level. It is possible for an infant with a serum phenylalanine level of 25-30 mg/dl at initiation of therapy with only Lofenalac to have inadequate phenylalanine for normal growth before completing one week of therapy.

*Lofenalac® is a specially processed casein hydrolysate from which 95% of phenylalanine has been removed. Manufactured by Mead Johnson Laboratories, Evansville, Indiana.

Prescribing, Calculating and Managing Diet

Prescription

In planning a therapeutic diet for the infant or child with PKU, a definite prescription includes recommended amounts of phenylalanine, protein and energy for each day. The dietary prescription for phenylalanine is based on serum phenylalanine analysis correlated with intake which indicates the child's tolerance for this amino acid. Recommended amounts are given for various ages in table 1 (3, 4); however, these are baselines for beginning treatment. The prescription must be individualized to the needs of each patient. Because of rapid growth and need for increasing nutrients to supply the material for this growth, frequent adjustments in the diet prescription are necessary, particularly during the first 6 months of life.

During this period of rapid growth, the phenylalanine prescription should be increased regularly so that the greatest tolerated intake to maintain serum phenylalanine between 2-10 mg/dl is ingested. This is in sharp contrast to former diet management techniques which considered a serum phenylalanine value of 2 to 4 mg/dl satisfactory with no indication for diet change. If there is a continued steady increase in the serum phenylalanine following an increase in prescription, immediate changes should be made. Many nutritionists in the PKU Collaborative Study found that weekly increases of phenylalanine, protein and energy were necessary during early infancy (2).

Lofenalac

Since it is impossible to obtain enough protein from ordinary foods without obtaining excess phenylalanine, a special product is used from which most of the phenylalanine has been removed. In the United States, Lofenalac—a casein hydrolysate—is the major product used to provide protein. In order to meet the phenylalanine needs for growth in the early months of life, evaporated milk or other foods high in phenylalanine must be added to the Lofenalac. Evaporated milk is the preferred form of milk since it has been heat treated and is less allergenic than pasteurized milk. Other natural food sources of phenylalanine are used in addition as the child begins to take solid food.

The formulation and nutrient content of Lofenalac are shown in tables

2 and 3 (5). Lofenalac is well fortified with fat, carbohydrate, vitamins and minerals. Some amino acids which are removed in the processing are also replaced. No supplemental vitamins or minerals, with the exception of fluoride, are necessary for the child receiving adequate amounts of Lofenalac since sufficient quantities of these nutrients have been added.

Serving Lists

Serving lists have been prepared to guide parents and professional counselors in selecting foods for the phenylalanine restricted diet (table 4). The lists are similar to the Diabetic Exchange Lists in that foods of similar phenylalanine content are listed together and can be exchanged one for another within a list to give variety to the diet (table 5).

Meal Guide

In addition to the serving lists the parents should be provided with a meal guide (table 6). This guide indicates the number of servings that the child should have from each list for each meal.

Prescription and Calculations

The following guidelines are helpful in prescribing and calculating a phenylalanine restricted diet (6):

1. *Establish the child's phenylalanine, protein, and energy needs according to his age.* Write the diet prescription to include the amounts of all three. Table 1 gives average recommendations by age. The phenylalanine suggested for infants and 2-3 year olds is the amount that maintained serum phenylalanine levels between 2 and 10 mg/dl in children in the Collaborative Study of Children Treated for Phenylketonuria (3).
2. *Establish the amount of Lofenalac to be given.* The amount of Lofenalac to be prescribed is determined by the total protein recommended for the child. From 85-90 percent of the total protein recommended *must* be met by Lofenalac since natural foods necessary to meet these recommendations would be too high in phenylalanine (table 1). There is considerable controversy over protein need of both normal and PKU infants, particularly when it is provided by a casein hydrolysate. Because of this, suggested protein intake during infancy was that found in the Collaborative Study to promote normal growth (3).
3. *State the amount of Lofenalac to be given in measures or in household measuring cup terms.*
4. *State the amount, if any, of milk to be added (table 1).* Since Lofenalac does not contain enough phenylalanine to supply the need for growth, evaporated milk or other natural protein should be added to Lofenalac in amounts appropriate to the child's needs to provide phenylalanine to maintain the desired serum phenylalanine level (table 1).

5. *State the amount of water to be used to mix the Lofenalac powder.* State as: "Water to make _____ ounces." The amount of water to be used is determined by the fluid requirement for the child's age, his preference for fluids and his taste for Lofenalac. Fluid (130-200 ml/kg) must be provided in a sufficient amount to prevent dehydration and some may be offered between formula feeding. Older children, according to individual tolerance, will demand extra fluid. Because Lofenalac is frequently used in a concentration of 1 measure to 1 ounce of water (45 kcalories/ounce) it is a concentrated source of protein and carbohydrate, and infants and children using this formula tend to have greater thirst than do most children who are taking regular formulas or milk.
6. *Subtract the phenylalanine, protein and energy that are supplied in the Lofenalac-milk mixture from the total prescription.* The remaining allowance of phenylalanine, protein and energy is to be given in solid foods (table 4).

It is important to maintain an adequate intake of energy (7). Non-protein sources of energy, such as Dextrimaltose, corn syrup, or sugar (in infant formulas) and suitable foods from the free list of non-protein calories can be added to maintain energy intake, and to satisfy the child's hunger without affecting the serum phenylalanine levels. Solids should be prescribed in numbers of servings and introduced at the appropriate ages (table 7) and in the usual textures as they would be for any child. Data in table 7 describe types of foods added at various ages to the diets of infants and children in the Collaborative Study. These recommendations are similar to those of Nelson, Vaughan, and McKay (8). It is important that children be given a variety of foods so that they may be included in the diet later in life to meet increasing phenylalanine requirements, to develop muscles needed for speech (9, 10), and to provide exercise for the teeth and gums.

7. *Calculate the phenylalanine, protein and energy in the servings of solid foods (table 4).* This added to the values derived from the Lofenalac-milk mixture should equal the total amounts prescribed.

The following illustrates how to prescribe and calculate a phenylalanine restricted diet:

Infants: Age—1 month; weight 4 kg.

1. Nutrients recommended daily (See table 1.)

Phenylalanine	(58 ± 18 mg/kg: use 50 mg × 4 kg)	= 200 mg
Protein	(4.4 g × 4 kg)	= 17.6 g
Energy	(120 kcal × 4 kg)	= 480 kcal
Fluid	(165 ml × 4 kg)	= 660 ml

2. Amount of Lofenalac (table 1) (Supplies 85% of protein at 1 month).
   .85 × 17.6 = 15 g protein from Lofenalac
3. Measures of Lofenalac (1.5 g protein per measure or tablespoon) (table 3).
   15 ÷ 1.5 = 10 measures (100 g) of Lofenalac
4. Amount of evaporated milk (table 1).
   1 ounce (30 ml) evaporated milk
5. Add water to make 22 ounces (660 ml).

6. Nutrients provided by Lofenalac-milk mixture (table 3).

	Phenylalanine (mg)	*Protein* (g)	*Energy* (kcal)
Prescription.....	200	17.6	480
Formula			
Lofenalac, 10 ms.	80	15.0	450
Evaporated milk, 1 oz.	106	2.2	44
Total	186	17.2	494
Remainder	14	....	....

7. Nutrients from solid food (table 4).

	Phenylalanine (mg)	*Protein* (g)	*Energy* (kcal)
1 Serving fruit (juice).....	15	0.6	70
Total from formula .	186	17.2	494
Total	199	17.8	564

Introduction of the Diet

Parents need assurance that the Lofenalac formula and infant foods will nourish their child and result in adequate growth and development. They also need to recognize that although at first the taste and odor of Lofenalac may be unpleasant to older children and adults, it is ordinarily well accepted by young babies.

There may be a decrease in intake of formula with weaning, a situation that commonly occurs in the non-PKU child as well. If some of the Lofenalac is given as a paste beginning at 3 to 4 months of age, this decrease in Lofenalac intake may be averted. Growth rate declines after the first year of life and appetite diminishes accordingly, so parents need reassurance that this decline occurs in all children, PKU and non-PKU alike. The full diet prescribed may not always be ingested each day, but there is no need to force-feed or coax the child to eat. As the child approaches 2 years of age, he should be well established on a three meal pattern of feeding, plus snacks. He should be eating a wide variety of foods of various textures, and be feeding himself with spoon and cup.

Dietary Control

Along with assessment of growth and development, the adequacy of phenylalanine intake is evaluated by frequent monitoring of the serum phenylalanine level. The first year is the period of most rapid growth and greatest vulnerability to nutritional insult. Therefore, weekly blood levels are suggested to determine the infant's tolerance for phenylalanine and to assure serum levels within the prescribed acceptable range. During the second year the frequency of monitoring is reduced to twice monthly; after the third year and onward, monthly. In order for blood tests to be useful in making the needed dietary adjustments they must be performed by the laboratory both accurately and promptly. The fluorimetric method (11) of phenylalanine determination is more accurate and thus preferable but the microbiological (Guthrie)

method (12) may be acceptable for monitoring purposes if antibiotics are not being used at the time a blood specimen is obtained (13). The serum phenylalanine level obtained by the microbiologic method during the time a child is treated with certain antibiotics is likely to be inaccurate and should not be used as the basis for a diet change (13). If properly instructed, parents may be given responsibility for obtaining the specimens and mailing them to the laboratory.

A record of food ingested prior to drawing blood for serum phenylalanine is essential and should be kept by the parents. The correlation between the amount of phenylalanine, protein and energy ingested, the child's health status, and the serum phenylalanine level should be considered before a diet change is prescribed.

The success of diet management rests with the parents and depends upon their understanding of the disease and their ability to cope with the diet and the child's behavior. Later on, successful management depends on the child's understanding of the diet restrictions and his self-discipline. These factors in turn are related to the help the parents receive from various professional members of the clinical team.

Indications for Diet Change

If serum phenylalanine levels are lower than desired, the cause may be inadequate intake of phenylalanine generally due to underprescription of phenylalanine or inadequate intake of formula due to excess volume. Phenylalanine prescription is readily increased by addition of graded amounts of milk, or volume can be decreased to the amount the child is able to ingest. Formulas as concentrated as 1 measure of Lofenalac to 1 ounce of water are frequently used without any untoward side effects. Lofenalac may also be mixed as a paste and spoon fed, even to the young infant. This method of feeding part of the Lofenalac as a paste should be started at 3-4 months of age. Extra fluids should be offered between feedings when Lofenalac is fed in this manner.

If serum phenylalanine levels are higher than desired, some causes and recommendations for diet change are given:

1. Intake of phenylalanine greater than need. This may be due to over prescription; misunderstanding of diet by parents; the child snitching food; or neighbors, grandparents, and siblings giving child forbidden foods.
2. Acute infections with concomitant tissue catabolism. There are differences of opinion as to the course of action to follow during infection. Some suggest a decrease in phenylalanine intake during this period, while others suggest an increase. Practically speaking, it is difficult to increase oral intake in the child who is ill or vomiting as appetite is usually decreased. Increasing intake of fluids and carbohydrate when possible appears to be the most acceptable course of action.
3. Inadequate intake of protein. Lofenalac intake should be increased.
4. Inadequate intake of energy. Non-protein energy sources should be encouraged (table 8).

Common Management Problems

Parents may treat the child as a "sick" child and not follow their usual patterns of child rearing. They often need the assistance of a professional individual trained in child growth and development to enable them to anticipate, understand, and encourage normal growth and behavior patterns in the child; however, the nutritionist should be cognizant of normal problems that occur during growth and development of the preschooler. Three valuable references in this respect have been published by Ilg (14), Lowenberg (15), and McEnery and Suydam (16). Nutritionists and other members of the team may also need to help parents in the area of child discipline and building of self esteem. Two references of help to parents are "Between Parent and Child" (17) and "How to Parent" (18).

When problems occur related to the addition of solids and self-feeding, the principles of feeding a normal child may be applied. Other feeding problems frequently encountered are:

1. *Loss of appetite.* If the child loses his appetite it is possible that he may be ill, he may be obtaining too many desserts or foods low in phenylalanine which depress appetite for prescribed foods, Lofenalac may be overprescribed and the appetite for other foods depressed, or serum phenylalanine level may be too low due to an inadequate phenylalanine intake.
2. *Hunger.* If the child is unduly hungry, he may have an inadequate prescription, he may be refusing Lofenalac so that the solids prescribed will not then satisfy his hunger or he may be refusing the prescribed foods in order to obtain desserts or sweet foods. Specialty products low in phenylalanine but high in energy listed in table 8 may be given in addition to the prescribed diet.
3. *Refusal of Lofenalac.* If the child at times refuses Lofenalac, his average intake over a week may be adequate but daily consumption may vary. It may be helpful to request a 7-day diet record to determine average intake for the week. (See tables 9 and 10 for directions and form for record-keeping). The parents may not be offering the Lofenalac consistently nor withholding other energy containing beverages. The Lofenalac may be mixed with too much water so the volume of fluid is too great, or with too little so that the liquid is too thick for the nipple. Also, the child may have become aware of parental anxieties about the Lofenalac and may be manipulating his parents by its refusal.
4. *Refusal of solids.* If the child refuses solids, he may be having a normal variation in appetite or in taste for certain foods. Food "jags" are common among young children. Or he may be holding out for sweets on the "free" list. Lofenalac may be over-prescribed and the energy ingested from it will depress appetite for other foods. Parental manipulation may also be a factor.
5. *Loose stools.* Loose, watery stools may occur following the introduction of Lofenalac. In this event, the daily prescription of Lofenalac may be decreased, and small amounts added until the total prescription is reached. If this approach is not successful, the physi-

cian should be consulted. In the presence of frank diarrhea, water intake should be adequate to prevent dehydration.

6. *Vomiting*. If vomiting is persistent or projectile in nature, the team physician should be alerted and asked to see the baby immediately. Factors other than organic causes may lead to vomiting. Overfeeding or force feeding, significantly elevated serum phenylalanine (>30 mg/dl), relaxed cardiac sphincter, or pyloric stenosis may be reasons for regurgitation. Formula thickened with some of the prescribed cereal may be used to prevent vomiting related to the relaxed cardiac sphincter. Small feedings at more frequent intervals and careful handling of the infant following meals may be beneficial.
7. *Inappropriate feeding behavior*. Such inappropriate feeding behavior as the child's failure to be weaned, to take solids, to chew, or to self-feed may be present for several reasons. The parents may have delayed offering solids, finger foods, or the cup and spoon. The parents may also believe that the child must eat all foods prescribed daily and may be encouraging inappropriate behavior in order to accomplish this. The child may be manipulating the parents to obtain what he wishes. On the other hand, if the child is mentally retarded, the feeding behavior may be appropriate for his developmental age. The child may be learning but very slowly.

   If the child attends nursery school, it is important that his teacher know that he is on a diet and be familiar with kinds and amounts of foods he can eat. Arrangements should be made to provide proper foods for his snack or lunch.

Parent Education

Nutritionists are primarily responsible for transmitting initial and ongoing diet instructions to parents who have the day-to-day responsibility for diet management. For teaching to be effective, the place, time, and emotional climate should all be considered. The functions of the nutritionist in parent education are: determining what is essential for the parents to know to manage diet well, outlining steps by which parents achieve this knowledge, participating in helping parents obtain the information needed, and evaluating knowledge and understanding of parents. Two handbooks that outline principles of education that could be applied in teaching parents of PKU infants and children are listed with the references (19,20). Primary caretakers should be at the initial diet instruction. Siblings, relatives, babysitters or friends who may have responsibility for occasional care should be involved later.

Initial instructions should be carried out in a quiet area free of interruption in order to allow development of rapport between clinical team members and the parents. Parents can best participate in the instruction session in an area designed for demonstration of formula and food preparation. Since parents have the responsibility of preparing the diet on the day the infant is discharged from the hospital (or the day diagnosed if not hospitalized), they are required to learn diet management when they are least receptive emotionally. The diet instruction should begin when the child is admitted for diagnosis or, if tested as an outpatient, when diagnostic tests are carried out. Parents will then have opportunity to review the instructions and ask for additional information. If this is not feasible, some discussions can occur by telephone or in writing.

Diet instruction should not be considered complete until parents or primary caretakers have demonstrated that they understand the phenylalanine restricted diet. Beginning diet instruction may extend over several sessions during the first year. Thorough understanding of diet management includes demonstrated ability in preparing formula, planning meals based on the meal guide, and recording actual intake of formula and food. The parents should be able to calculate phenylalanine, protein, and energy intake and to replace phenylalanine not ingested in the prescribed amount. Parents may be expected to demonstrate their knowledge of the major nutrient content of Lofenalac, milk and foods on the serving lists as they plan meals and record intake.

Booklets and articles that may be used to supplement the initial diet instructions are listed with the references (21-26). An animated film,

"Phe and Me" (27), has been prepared to help children and their parents understand the special characteristics and needs of a child with PKU.

Sample forms and directions used in the Collaborative Study of Children Treated for Phenylketonuria for recording diet intake are given in tables 9 and 10. Providing parents with appropriate directions and forms for recordkeeping facilitates obtaining required data for diet management and helps parents and members of the clinical team manage the child on the phenylalanine-restricted diet effectively. A summary sheet of patient management that provides rapid information on the course of treatment to the medical team is on pages 12-13. It is also helpful in relating intake to growth and serum phenylalanine levels.

The age at which the diet should be terminated has not been determined and there is much difference in practice in this regard. The implication for girls and pregnancy may influence the decision regarding the time to discontinue the diet.

Progre

Name_____ B.D._____ B. Length___
B. Weight___

Physical Data | Laboratory D

Date	Age		Ht	Wt		HC	Serum Phe	Serum Tyr	Hgb	Total Pro	Alb
	yr	mo	(in)	(lb)	(oz)	(in)	(mg %)	(mg %)	(gm %)	(gm %)	(gm %)

Summary Sheet

Ethnic Origin

Father: _____

Mother: _____

_____ Ht. of Fa. _____ Ht. of Mo. _____

_____ IQ of Fa. _____ IQ of Mo. _____

_____

a

Dietary Intake Data

lob	EEG	Bone Age	DQ/IQ	Phe	Pro	Energy	Comments
m %)	(N/A)	(N/R)		(mg)	(gm)	(Kcal)	

Table 1.

PHENYLALANINE, PROTEIN, AND ENERGY FOR INFANTS AND PRESCHOOLERS
Recommended Intake and Prescribed Sources

Age	Suggested phenylalanine	Suggested protein[a]	Suggested energy[d]	Percent protein from Lofenalac	Amount of Lofenalac	Evaporated milk[f]
(mo.)	(mg/kg/day)	(g/kg/day)	(kcal/kg/day)		(ms[e]/kg)	(oz.)
0–3	58±18[b]	4.4	120	85	2½–3	1–3
4–6	40±10[b]	3.3	115	85	2–2½	½–2
7–9	32±9[b]	2.5	110	90	1½–2	½–1½
10–12	30±8[b]	2.5 (total g/day)[d]	105 (kcalories/ day)	90	1½–2 (total ms/day)	½–1
13–24	25[c]	25.0	1300	90	16	0–1
25–36	24±8[b]	25.0	1300	90	16	None
37–48	20[c]	30.0	1300	90	19	None
49–72	18[c]	30.0	1800	90	19	None

[a]Considerable controversy exists over protein need of both normal and PKU infants particularly when it is provided by a casein hydrolysate. Because of this, recommended protein intake during infancy is the amount found by the Collaborative Study to promote normal growth (3).
[b]From reference 3.
[c]From reference 4.
[d]From reference 7.
[e]A measure of Lofenalac equals 10 g or 1 tablespoon.
[f]One ounce of evaporated milk contains 106 mg. phenylalanine, 2.2 g. protein and 44 calories.

Table 2.

FORMULATION OF LOFENALAC POWDER

		Powder (% W/W)
Casein hydrolysate, specially processed[a]		15
Corn oil		18
Carbohydrate		57
Dextrimaltose	46.00	
Arrowroot starch	8.80	
Gluconic acid	2.20	
Sucrose	0.09	
Minerals		5
Vitamins		
Amino acids		
L-methionine		
L-tryptophan		
L-tyrosine		
Moisture		2

[a]This hydrolysate has been modified by removal of most of the phenylalanine, and contains only 0.4% phenylalanine.

Table 3.

COMPOSITION OF LOFENALAC

Nutrients	Value (100 g powder)	Value (Packed measure*)
Kcalories	450	45
Protein equivalent (g)	15	1.5
Fat (g)	18	1.8
Carbohydrate (g)	57	5.7
Amino Acids (g)		
L-arginine	0.34	0.03
L-histidine	0.27	0.03
L-isoleucine	0.78	0.08
L-leucine	1.45	0.14
L-lysine	1.58	0.16
L-methionine	0.51	0.05
L-phenylalanine	0.08	0.008
L-threonine	0.81	0.08
L-tryptophan	0.20	0.02
L-tyrosine	0.82	0.08
L-valine	1.19	0.12
Minerals (mg)		
Calcium	648	65
Chloride	561	56
Copper	0.4	0.04
Iodine	0.047	0.0047
Iron	8.6	0.86
Magnesium	54	5.4
Manganese	1.4	0.14
Phosphorus	450	45
Potassium	719	72
Sodium	324	32
Zinc	3	0.3
Vitamins		
A (IU)	1439	144
D (IU)	288	29
E (IU)	7.2	0.7
Ascorbic acid (mg)	37	3.7
Folic acid (mcg)	36	3.6
Niacin (mg)	6	0.6
Riboflavin (mg)	0.72	0.07
Thiamine (mg)	0.4	0.04
B6 (mg)	0.4	0.04
B12 (mcg)	1.8	0.18
Biotin (mg)	0.02	0.002
Pantothenic acid (mg)	2	0.2
Inositol (mg)	72	7.2
Choline (mg)	61	6.1

*1 packed level scoop or tablespoon.

Table 4.

AVERAGE NUTRIENT CONTENT OF SERVING LISTS

List	Phenylalanine (mg)	Protein (g)	Energy (kcal)
Vegetables			
Strained and junior	15	0.5	20
Table	15	0.5	10
Fruits			
Strained and junior	15	0.6	150
Table and juices	15	0.6	70
Bread and cereals	30	0.6	30
Fats	5	0.1	60

When analyses were not available, the phenylalanine content was calculated on the following basis:

Breads and cereals	Phenylalanine 5% of protein
Fat	Phenylalanine 5% of protein
Fruits	Phenylalanine 2.6% of protein
Vegetables	Phenylalanine 3.3% of protein

Table 5.

SERVING LISTS
PART A—STRAINED AND JUNIOR FOODS

Food	Grams per Tbsp	Amount	Phenylalanine (mg)	Protein (g)	Energy (kcal)
Each Serving as Listed Below Contains 15 Milligrams Phenylalanine					
Vegetables	14.3				
Mixed vegetables		3 tbsp	16	.5	15
Garden vegetables		2 tbsp	16	.5	8
Beets		6 tbsp	15	1.1	33
Carrots		5 tbsp	15	.5	19
Creamed spinach		2 tbsp	15	.9	14
Green beans		2 tbsp	15	.3	7
Squash		3 tbsp	14	.3	13
Peas		1 tbsp	17	.5	6
Fruits	14.3				
Applesauce		11 tbsp	15	.3	127
Applesauce and apricots		10 tbsp	15	.4	124
Applesauce and cherries		18 tbsp	15	.5	239
Applesauce and pineapple		10 tbsp	15	.4	169
Apricots and tapioca		12 tbsp	14	.7	138
Bananas and tapioca		8 tbsp	15	.8	137
Peaches		5 tbsp	16	.4	60
Pears		10 tbsp	15	.6	99
Pears and pineapple		11 tbsp	15	.6	111
Plums and tapioca		11 tbsp	15	.5	154
Prunes and tapioca		8 tbsp	15	.7	105
Bananas with pineapple and tapioca		11 tbsp	15	.6	180
Apples and pears		18 tbsp	15	.5	208

Table 5.

SERVING LISTS (Continued)
PART A—STRAINED AND JUNIOR FOODS (Continued)

Food	Grams per Tbsp	Amount	Phenylalanine (mg)	Protein (g)	Energy (kcal)
Note: Free food					
Applesauce and raspberries		10 tbsp	4	.1	151
Applesauce and cherries		7 tbsp	6	.2	93
Apples and cranberries		16 tbsp	5	.2	213
Each Serving as Listed Below Contains 15 Milligrams of Phenylalanine					
Fruit juices	15.0				
Apple		16 oz	14	.5	235
Apple-apricot		16 oz	14	.5	336
Apple-cherry		10 oz	15	.6	135
Apple-grape		16 oz	14	.5	312
Apple-pineapple		16 oz	14	.5	336
Mixed fruit		6 oz	14	.5	106
Orange		4 oz	16	.6	60
Orange-apple		6 oz	14	.5	97
Orange-apple-banana		4 oz	16	.6	78
Orange-apricot		3 oz	14	.5	55
Orange-pineapple		4 oz	16	.6	71
Pineapple		6 oz	14	.5	99
Pineapple-grapefruit drink		6 oz	14	.4	70
Prune-orange		4 oz	16	.6	90
Apple-prune		10 oz	15	.6	204
Each Serving as Listed Below Contains 30 Milligrams of Phenylalanine					
Breads and cereals					
Dry cereals	2.4				
Barley		2 tbsp	28	.5	18
Mixed cereal		2 tbsp	28	.6	18
Oatmeal		2 tbsp	30	.8	15
Rice cereal		4 tbsp	31	.6	36
Mixed cereal with bananas		2 tbsp	29	.6	21
Oatmeal with bananas		2 tbsp	30	.6	19
Rice cereal with strawberries		4 tbsp	30	.6	33
Barley with mixed fruit		3 tbsp	31	.6	information not available
Cereals in Jars	14.3				
Strained					
Mixed with applesauce and bananas		3 tbsp	30	.6	39
Oatmeal with applesauce and bananas		4 tbsp	30	.5	47
Rice with applesauce and bananas		15 tbsp	30	.6	148
Rice with mixed fruit		3 tbsp	30	.6	37
Junior					
Mixed with applesauce and bananas		3 tbsp	30	.6	39
Oatmeal with applesauce and bananas		4 tbsp	30	.5	47
Strained vegetables	14.3				
Creamed corn		3 tbsp	30	.7	30
Sweet potatoes		3 tbsp	29	.6	30

Table 5.

SERVING LISTS
PART B—TABLE FOODS

Food	Grams per Tbsp	Amount	Phenylalanine (mg)	Protein (g)	Energy (kcal)
Each Serving as Listed Below Contains 15 Milligrams Phenylalanine					
Vegetables					
Asparagus, cooked	9	3 tbsp or 1½ stalks	17	.6	5
Beans, green, cooked	8	3 tbsp	14	.4	6
Beans, yellow, cooked	8	¼ cup	16	.4	7
Beans, sprouts, Mung, cooked	8	1 tbsp	16	.3	3
Beets, cooked	10	⅔ cup	16	1.2	34
Beet greens, cooked	13	3 tbsp	15	.6	6
Broccoli, cooked, chopped	10	1 tbsp	14	.4	3
Brussels sprouts, cooked	—	1 medium	13	.4	4
Cabbage, raw, shredded	6	½ cup	15	.6	12
Cabbage, cooked	10	⅓ cup	14	.6	11
Carrots, raw	—	½ large or 1 small	18	.6	21
Carrots, cooked	—	⅓ cup	15	.5	16
Cauliflower, cooked	7	3 tbsp	17	.5	5
Celery, raw	6	6 tbsp or 2 stalks	15	.3	6
Celery, cooked, diced	8	6 tbsp	18	.4	7
Chard leaves, cooked	10	3 tbsp	14	.5	5
Collards, cooked	11	1 tbsp	13	.4	4
Cucumber, pared, raw	—	1 whole	14	.6	14
Eggplant, diced, raw	13	2 tbsp	13	.3	7
Eggplant, cooked	13	3 tbsp	17	.4	7
Kale, cooked	7	2 tbsp	18	.4	4
Lettuce	—	2 leaves	14	.4	5
Mushroom, raw	4	3 small	17	.8	8
Mushroom, canned	13	3 tbsp	16	.7	7
Mushroom, sauteed	17	½ large	13	.2	10
Mustard greens, cooked	13	2 tbsp	16	.5	5
Okra, cooked	—	3 tbsp	17	.7	10
Onion, raw, chopped	10	¼ cup	15	.6	15
Onion, cooked	13	¼ cup	16	.6	15
Onion, young, scallion	—	2 whole	15	.6	14
Parsley, raw, chopped	3	4 tbsp	17	.4	5
Parsnips, cooked, diced	13	3 tbsp	18	.6	26
Peppers, raw, chopped	10	3 tbsp	17	.4	7
Pickles, dill	—	1 large	16	.7	11
Pickles, sweet	13	1 large	16	.7	146
Pickles, sweet relish	13	8 tbsp	14	.5	144
Pumpkin, cooked	14	4 tbsp	16	.6	18
Radishes, raw	—	3 small	13	.3	5
Sauerkraut	15	¼ cup	15	.6	11
Spinach, cooked	11	1 tbsp	15	.3	3
Squash, summer, cooked	13	5 tbsp	16	.6	9
Squash, winter, cooked	13	¼ cup	16	.6	20
Tomato, raw	17	½ small	14	.6	11
Tomato, canned	17	¼ cup	17	.7	14
Tomato juice	14	¼ cup	16	.6	13
Tomato catsup	17	2 tbsp	17	.7	36
Tomato puree	6	6 tbsp	15	.6	14
Tomato sauce	18	3 tbsp	18	.7	52
Turnip greens, cooked	9	2 tbsp	18	.4	4
Turnips, diced, cooked	10	9 tbsp	15	.7	21

Table 5.

SERVING LISTS (Continued)
PART B—TABLE FOODS (Continued)

Food	Grams per Tbsp	Amount	Phenylalanine (mg)	Protein (g)	Energy (kcal)
Each Serving as Listed Below Contains 15 Milligrams of Phenylalanine					
Soups (Prepared with equal volume of water)					
Asparagus (Campbell's condensed)		3 tbsp	15	.5	12
Beef broth (Campbell's condensed)		2 tbsp	17	.6	4
Celery (Campbell's condensed)		3 tbsp	15	.3	16
Minestrone (Campbell's condensed)		3 tbsp	18	.8	17
Mushroom (Campbell's condensed)		2 tbsp	15	.3	17
Onion (Campbell's condensed)		3 tbsp	19	.9	11
Tomato (Campbell's condensed)		3 tbsp	17	.4	16
Vegetarian vegetable (Campbell's condensed)		3 tbsp	14	.3	12
Vegetable and beef broth (Campbell's condensed)		4 tbsp	16	.5	15
Clam chowder and tomato (Campbell's condensed)		3 tbsp	14	.4	15
Chicken gumbo (Campbell's condensed)		2 tbsp	14	.4	7
Cream of chicken (Campbell's condensed)		2 tbsp	15	.4	12
Beef noodle (Campbell's condensed)		2 tbsp	19	.5	8
Each Serving as Listed Below Contains 30 Milligrams of Phenylalanine					
Fruits					
Apple, raw		2½ small	15	.5	145
Applesauce	19	¾ cup	14	.5	207
Apricots, raw		1½ medium	14	.6	31
Apricots, canned		3 halves	14	.6	86
Apricots, dried		2 halves	14	.6	31
Avocado, cubed or mashed	9.5	3 tbsp	14	.6	48
Banana, raw sliced		½ small or ⅓ C sliced	17	.6	43
Blackberries, canned, syrup	15.6	5 tbsp	16	.6	71
Blackberries, raw	9	6 tbsp	17	.6	31
Blueberries, raw	8.8	10 tbsp	16	.6	55
Blueberries, frozen, unsweetened	10	9 tbsp	16	.6	50
Blueberries, canned, syrup	15	10 tbsp	15	.6	151
Cantaloupe, raw, diced	15	5 tbsp	16	.5	23
Sour cherries	13	4 tbsp	16	.6	30
Sweet cherries, canned, syrup	13	5 tbsp	15	.6	53
Cranberries, raw	6	1½ cups	14	.6	66
Cranberry sauce	20	1⅔ cups	16	.5	780
Cranberry, sweetened, cooked	13	1½ cups	16	.6	555

Table 5.

SERVING LISTS (Continued)
PART B—TABLE FOODS (Continued)

Food	Grams per Tbsp	Amount	Phenylalanine (mg)	Protein (g)	Energy (kcal)
Each Serving as Listed Below Contains 30 Milligrams Phenylalanine					
Dates	11	2 tbsp	15	.6	69
Figs, raw	—	1 large	15	.6	40
Figs, canned, syrup	—	4 small	16	.6	105
Figs, dried	—	1 small	16	.6	41
Fruit cocktail	13	¾ cup	16	.6	119
Grapefruit, raw	12	¾ cup or ½ large	14	.7	59
Grapes, Thompson, seedless	10	½ cup (12 grapes)	14	.5	54
Guava, raw	—	1 small	16	.6	47
Honeydew, raw, diced	13	5 tbsp	16	.5	21
Mango, raw	—	½ medium	18	.7	66
Nectarines, raw	—	2 large	15	.8	80
Oranges, raw	—	1 medium (3" diam)	18	1.5	74
Papaya, raw	16	⅓ medium or 6 tbsp	16	.6	39
Peaches, raw	11	1 lrg or ¾ C sliced	16	.8	50
Peaches, canned, syrup	16	4 medium halves	16	.8	156
Peaches, dried	10	2½ tbsp	16	.8	66
Pears, raw	—	½ medium (3x2½")	17	.7	61
Pears, canned, syrup	16	5 small halves	15	.5	190
Pears, dried	—	½ pear	12	.4	35
Pineapple, raw	8	1 cup diced	14	.5	67
Pineapple, canned, syrup	16	2 large slices	16	.6	148
Plums, Damson, raw	13	2 whole	13	.5	66
Plums, prune-type, raw	13	1½ whole	17	.4	38
Plums, canned, syrup	14	4 whole	13	.5	110
Prunes, dried, medium	—	3 whole	18	.4	54
Raisins, dried, seedless	10	2 tbsp	15	.5	58
Raspberries, black, raw	11	¼ cup	17	.7	32
Raspberries, red, raw	8	6 tbsp	15	.6	27
Raspberries, black, canned, syrup	13	4 tbsp	15	.6	27
Raspberries, red, canned, syrup	13	7 tbsp	16	.6	32
Rhubarb, cooked, added sugar	15	6 tbsp	15	.5	141
Strawberries, raw	9	10 large	17	.7	37
Strawberries, frozen, whole	15	15 large	15	.6	138
Tangerine	—	1 small or ½ large	12	.4	23
Watermelon, ball or cubes	12.5	⅔ cup	17	.7	36
Each Serving as Listed Below Contains 30 Milligrams Phenylalanine					
Breads and Cereals					
Prepared cereals					
Alpha Bits		3 tbsp	27	.6	23
Apple Jacks		6 tbsp	32	.7	47
Cap'n Crunch		5 tbsp	29	.7	65
Cheerios		2 tbsp	27	.5	15
Corn Chex		½ cup	29	.6	30
Cornflakes		¼ cup	28	.6	31
Froot Loops		5 tbsp	36	.6	40
Kix		½ cup	28	.6	32

Table 5.

SERVING LISTS (Continued)
PART B—TABLE FOODS (Continued)

Food	Grams per Tbsp	Amount	Phenylalanine (mg)	Protein (g)	Energy (kcal)
Each Serving as Listed Below Contains 30 Milligrams Phenylalanine					
Lucky Charms		3 tbsp	29	.5	23
Puffed Rice		10 tbsp	31	.6	40
Puffed Wheat		¼ cup	32	.9	12
Cap'n Crunchberries		¼ cup	31	.5	47
Cap'n Crunch Peanut Butter Cereal		3 tbsp	32	.6	38
Rice Chex		6 tbsp	31	.6	44
Rice Krinkles		½ cup	28	.5	63
Rice Krispies		¼ cup	28	.5	30
Quisp		½ cup	31	.8	68
Shredded Wheat		¼ biscuit	29	.6	21
Sugar Frosted Flakes		½ cup	30	.6	62
Sugar Pops		½ cup	30	.6	43
Sugar Smacks		7 tbsp	31	.7	55
Trix		6 tbsp	30	.7	47
Wheaties		¼ cup	31	.7	25
Wheat Chex		7 biscuits	31	.7	25
Cocoa Krispies		½ cup	29	.5	48
Team Flakes		10 tbsp	30	.6	39
Quaker Life		1 tbsp	30	.6	12
King Vitamin		½ cup	32	.6	63
Special K		2 tbsp	29	.6	11
Franken Berry		7 tbsp	30	.6	50
Count Chocula		6 tbsp	28	.6	42
Sir Grapefellow		5 tbsp	27	.5	39
Boo Berry		5 tbsp	27	.5	39
Granola		1 tbsp	32	.6	19
Grapenuts		1 tbsp	27	.6	26
Grapenut Flakes		3 tbsp	29	.7	30
Cooked cereals					
Cornmeal		4 tbsp	29	.7	30
Cream of Rice		5 tbsp	31	.6	38
Cream of Wheat		2 tbsp	28	.6	17
Farina		3 tbsp	31	.6	19
Malt-O-Meal		2 tbsp	30	.6	20
Oatmeal		2 tbsp	33	.6	17
Pettijohns		2 tbsp	32	.7	23
Ralston		2 tbsp	31	.6	16
Rice, white		3 tbsp	28	.5	29
Rice, brown		2 tbsp	28	.5	25
Wheatena		2 tbsp	31	.6	22
Wheat Hearts		2 tbsp	31	.7	17
Crackers					
Animal Crackers		5	33	.7	43
Arrowroot Cookies		2	30	.6	45
Graham Crackers		1	28	.6	21
Ritz Crackers		3	35	.7	45
Saltines		2	27	.5	26
Tortilla, corn		¼ (6" D)	33	.7	27
Wheat Thins		4	34	.7	32
Meal Mates		1	25	.5	24

Table 5.

SERVING LISTS (Continued)
PART B—TABLE FOODS (Continued)

Food	Grams per Tbsp	Amount	Phenylalanine (mg)	Protein (g)	Energy (kcal)
Each Serving as Listed Below Contains 30 Milligrams of Phenylalanine					
Miscellaneous					
Corn, cooked		2 tbsp	29	.5	17
Hominy grits, cooked		6 tbsp	32	.7	31
Macaroni, cooked		2 tbsp	32	.6	20
Noodles, cooked		2 tbsp	32	.7	20
Potato chips		6 (2" D)	29	.6	68
Potato, Irish, cooked		⅓ potato (2¼" D)	29	.6	21
Potatoes, French fried		3 (½x½x2")	30	.6	41
Instant potatoes (dry) without milk		5 tbsp	33	.7	36
Popcorn, popped, plain		5 tbsp	29	.6	19
Spaghetti, cooked		2 tbsp	32	.6	20
Sweet potatoes, cooked		3 tbsp	28	.6	38
Instant sweet potatoes, dry without milk		2 tbsp	29	.6	53
Each Serving as Listed Below Contains 5 Milligrams Phenylalanine					
Fats					
Butter		1 tbsp	4	.1	100
French Dressing, commercial		5 tbsp	5	.2	442
Margarine		1 tbsp	5	.1	108
Miracle Whip		1 tbsp	5	.1	68
Olives, green		2 tbsp	5	.2	16
Olives, ripe		2 tbsp	5	.2	18
Mayonnaise		2 tbsp	5	.1	72
Desserts—Comstock					
Apple pie filling		¼ Cup	1	*	89
Apricot pie filling		¼ Cup	8	.4	79
Blackberry pie filling		¼ Cup	1	*	109
Blueberry pie filling		¼ Cup	6	.2	83
Boysenberry pie filling		¼ Cup	11	.4	93
Cherry pie filling		¼ Cup	11	.4	83
Peach pie filling		¼ Cup	4	.2	78
Pineapple pie filling		¼ Cup	4	.1	70
Raspberry pie filling		¼ Cup	8	.3	106
Strawberry pie filling		¼ Cup	5	.2	79
*Less than .5					
Free foods					
These foods contain little or no phenylalanine. May be used as desired.					
Apple juice		6 oz			85
Candies:					
Butterscotch		1 piece			20
Cream mints		1 piece			7
Fondant, patties or mint		1 piece			40
Gum drops		1 large			35
Hard candy		2 pieces			39
Jelly beans		10			110
Lollipops		1 medium (2½" diam)			108
Carbonated beverages		6 oz			78

Table 5.

SERVING LISTS (Continued)
PART B—TABLE FOODS (Continued)

Food	Grams per Tbsp	Amount	Phenylalanine (mg)	Protein (g)	Energy (kcal)
Corn syrup		1 tbsp			58
Danish dessert		½ cup			123
Diet margarine		1 tbsp			50
Fruit butter		1 tbsp			37
Fruit ices		½ cup			69
Jellies		1 tbsp			55
Kool Aid		4 oz			48
Lemonade		4 oz			53
Maple syrup		1 tbsp			50
Molasses		1 tbsp			46
Popsicle		1 twin bar			95
Shortening		1 tbsp			123
Start liquid		4 oz			60
Sugar, brown		1 tbsp			46
Sugar, granulated		1 tbsp			43
Sugar, white, powdered		1 tbsp			59
Tang liquid		4 oz			59
Miscellaneous					
Cake flour		1 tbsp	29	.6	29
Corn starch		1 tbsp	1	trace	29
Tapioca, granulated		1 tbsp	2	.1	35
Wheat starch		1 tbsp	1	trace	25
Nondairy creams					
Coffee rich		1 tbsp	3	trace	23
Cool whip		1 tbsp	2	trace	14
Dzert whip, liquid		1 tbsp	9	.2	44
Rich's topping		1 tbsp	—	—	43
Mocha mix		1 tbsp	2	trace	13

Less than .04 gm. protein = trace

Form 6.

PHENYLALANINE—RESTRICTED DIET MEAL GUIDE

Date_____ Age_____ Name _____

Wt. _____ Ht. _____

Approximate total milligrams phenylalanine daily _____
Approximate total grams protein daily _____
Approximate total energy (Kcalories) daily _____

	Milligrams phenylalanine	Grams protein	Kcalories energy
_____ meas. packed dry Lofenalac			
Add _____ ounces evaporated milk			
Add water to make _____ ounces: per ounce			
BREAKFAST			
_____ Lofenalac			
_____ Servings fruit			
_____ Servings bread/cereal			
_____ Servings fat			
_____ Servings free foods			
MID-MORNING			
_____ Servings			
LUNCH			
_____ Lofenalac			
_____ Servings fruit			
_____ Servings vegetable			
_____ Servings bread			
_____ Servings dessert			
_____ Servings fat			
_____ Servings free foods			
MID-AFTERNOON			
_____ Servings			
SUPPER			
_____ Lofenalac			
_____ Servings fruit			
_____ Servings vegetable			
_____ Servings bread			
_____ Servings dessert			
_____ Servings fat			
_____ Servings free foods			
BEDTIME			
_____ Servings			
TOTAL			
Per Kg			

COMMENTS:

Table 7.

TIMETABLE FOR SOLID FOODS AND SELF-FEEDING

Food or behavior	2–3 months	3–4 months	5–8 months	9 months	10–12 months	15–18 months
Lofenalac® paste		Begin				
Fruit puree	Begin					
Cereals, strained		Begin				
Vegetable puree		Begin				
Low Phe* breads			Begin			
Coarsely chopped foods				Begin		
Cup feeding				Begin		
Finger and spoon feeding					Begin	
Raw foods						Begin

*Specially prepared breads very low in phenylalanine.

Table 8.

SPECIALTY PRODUCTS AND THEIR SOURCES

Product	Source
Cellu® Wheat Starch	Chicago Dietetic Supply, Inc.
Lo Pro Pastas	405 East Shawnut Ave.
Low Protein Baking Mix & Bread	La Grange, Ill. 60525
Controlyte	D. M. Doyle Pharmaceutical Co.
	Highway 100 at West Twenty-Third St.
	Minneapolis, Minn. 55416
Low Protein Bread & Mix	Ener-G Foods, Inc.
Potato Mix	1526 Utah Ave., South
Egg Replacer	Seattle, Wash. 98134
Aproten® Low Protein Pastas, Rusks, Porridge	General Mills Chemicals, Inc.
Cal-Power Beverages	4620 W. 77th St.
Dietetic Paygel® Baking Mix	Minneapolis, Minn. 55440
Dietetic Paygel® Wheat Starch	
Low Protein Canned Bread	
Prono® Imitation Jello	

FORM 9

COLLABORATIVE STUDY OF CHILDREN TREATED FOR PHENYLKETONURIA

Report of Diet Diary

PARENTS LEAVE BLANK
Serum phe level _____ mg% McR _____ G _____

Date of Specimen _____

Time of Specimen _____ am pm

Time of Last Meal _____ am pm

Case No. _____ Birthdate _____

Name _____

Recorded by _____

Weight _____ Height _____

Measured at home _____ or clinic _____

How is formula mixed?

_____ Packed measures Lofenalac

_____ oz. _____ Milk _____

Water to make _____ oz. _____

Type of record

Regular _____

Challenge _____

Diagnostic _____

Vitamins or minerals given, if any:

Kind _____

Amount _____

PLEASE RECORD FOOD EATEN FOR THREE (3) CONSECUTIVE DAYS PRIOR TO OBTAINING BLOOD SPECIMEN				PARENTS LEAVE BLANK					
DATE TIME	FOOD OR LIQUID OFFERED	AMOUNT EATEN	PHE* MG.	PROT. G.	K CAL	ITEM NO.	AMOUNT	†	Y U G

Form 10.

COLLABORATIVE STUDY OF CHILDREN TREATED FOR PHENYLKETONURIA
DIRECTIONS FOR RECORDING DIET DIARY

---

1. Use U.S. Bureau of Standards approved measuring cups and spoons for all servings. All measurements are level.
2. Utensils needed:
   1 set standard measuring spoons
   1 set standard measuring cups
   1 standard glass measuring cup
   1 quart measuring pitcher
   1 ruler
3. Equivalent measures:
   3 tsp. = 1 tbsp.
   16 tbsp. = 1 cup
   1 fluid oz. = 2 tbsp.
   1 jar strained Infant Fruits and Vegetables—4½ oz. = 9 tbsp.
   1 jar chopped Junior Fruits and Vegetables—7½ oz. = 15 tbsp.
4. Record at the time eaten the exact amount of all food the child has eaten during the three days prior to obtaining the blood specimen.
5. Amount of *formula* taken should be recorded in ounces.
6. Amount of *fruit juice* taken should be recorded in ounces.
   Whole fruits should be recorded as number and size, as small, medium or large, with approximate measurements, such as 2½x2".
   Strained and Junior fruits should be recorded in level tablespoon or teaspoon portions.
7. *Vegetables* should be measured as served.
   Strained and junior vegetables in level tablespoon or teaspoon portions.
   Cooked vegetable in cup portions or number & length of spears (asparagus, broccoli).
   Raw vegetables record number and size of pieces, such as 2 carrot sticks 4 inches long.
8. *Cereals* should be measured as served.
   Baby cereals—in tablespoon portions, level measurements, dry.
   Cooked—tablespoon or cup portions, level measurements, after cooking.
   Dry—level cup portions or tablespoons.
   Biscuits—as number of biscuits eaten; list height and diameter as ½x½".
9. *Fats*—record in level teaspoons or tablespoons—include those used in cooking. If butter is used, list as butter, if margarine list brand, if oil list kind, as corn oil or olive oil.
10. *Desserts*—describe size of portion, or unit given in recipes.
11. *Free foods* should be listed with exact amount and number, such as 4 large gumdrops.
12. List name of foods and brand name if necessary, such as oatmeal, rather than cereal, example, "Quaker Oats."
13. List brand names of strained or Junior foods.
14. List amount of ingredients in mixed dishes unless a standard recipe has been given previously.

Form 20
PA: 09/67

References

1. Dobson, J., M. Williamson, C. Azen. Intellectual assessment of 97 four-year-old children with phenylketonuria. Pediatrics, (in press).
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